contemplated this Appearance for above an Hour, *viz.* from $10\frac{1}{2}^{h}$ to near twelve, and we could not be deceiv'd as to its Reality; but the Slowneſs of its Motion made us at that time conclude that it had none, and that it was rather a *Nebula* than a *Comet*,

However, ſuſpecting that it might have ſome Motion, I attended the next Night, *June* 11th, at the ſame Hours and in the ſame Company, when with ſome Difficulty by reaſon of the Thickneſs of the Air, we found the two little Stars, but the *Nebula* could not at that time be ſeen, which we then imputed to the want of a clearer Sky. But on *Saturday*, *June* 15. the Moon being abſent, and the Air perfectly clear, we had again a diſtinct View of the two Stars, with an entire Evidence that there remained no Footſtep or Sign of it, in the place where we had firſt ſeen this *Phænomenon*, which we therefore now found to be a Comet, and that being far without the Orb of the Earth, and in it ſelf a very ſmall Body, it appeared only like a little Speck of a Cloud, ſuch as would ſcarce have been diſcerned in an ordinary Teleſcope, much leſs by the naked Eye.

IX. *An Account of Books*, I. Joannis Poleni in Gymnaſio Patavino Phil. Ord. Prof. & Scient. Societatum Regalium, quæ Londini & Berolini ſunt, Sodalis, *De Motu Aquæ mixto*, Libri duo, *&c.* 4$^{\text{to}}$. Patavii 1717.

THE Subject here treated of not having hitherto fallen under the Conſideration of Mathematical Writers, the Learned Author is obliged to make uſe of ſeveral Terms, which are either wholly new, or at leaſt

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leaſt are apply'd in a ſenſe ſomewhat different from their common Acceptation; for which reaſon he begins his Work with a Sett of Definitions.

Aqua mortua, or a dead Water is that, whoſe Surface being every where equally diſtant from the *Centrum gravium*, no part of it can deſcend any lower, without forcing ſome other upward, and conſequently the Whole is without Motion.

Aqua viva, or a running Water is that which is put into motion by the Preſſure of the Incumbent Water, and whoſe Motion is oppoſed by no other Water lying in its way.

The motion of a running Water is call'd *Motus ſimplex*, or the ſimple Motion.

If a running Water moving over the Surface of a dead Water, do, by its Preſſure communicate part of its Motion to the dead Water; the compound Motion with which the whole Body of the Water flows, is called *Motus mixtus*, or the mixt Motion.

If a Water at different Depths from the Surface run with different Velocities, the *mean Velocity* is that, which being the ſame at all Depths, will diſcharge the ſame Quantity of Water.

Next follows a ſhort Hiſtory of the Original, and Progreſs of the Doctrine of running Waters, the Invention of which our Author juſtly aſſerts to the Learned *Caſtellus*, and defends him againſt *Fabretti*, who has maintain'd that *Caſtellus*'s fundamental Propoſition of the Quantity diſcharged being *cæteris paribus* in proportion to the Velocity, was known, and publickly taken notice of before him by *Frontinus*.

The Author allows *Caſtellus* to have been miſtaken in determining the Velocity of Water running out at the bottom of a Veſſel, he having aſſerted that Velocity to be as the Depth of the Water

Three Years after *Caſtellus*'s Book came out, this Miſtake was corrected by the famous *Torricellius*, who was the firſt that maintain'd, that the Velocity of the Water running out was in a ſubduplicate *Ratio* of the Depth, but gave no Demonſtration of it.

This Propoſition, ſays our Author, was confirm'd by the Experiments of *Maggiotti*, *Mariotte*, and *Guglielmini*, and has ſince been demonſtrated by Mr. *Varignon*, by *Herman* in his *Phoronomia*, and *John Bernoulli*. as reported by *Herman* in the *Acta Lipſienſia*.

Here it may not be improper to take notice, that the Demonſtrations of thoſe three Learned Perſons are all grounded upon this Suppoſition, that the Water running out from the Hole is preſt upon by the Column of Water incumbent upon it, which may eaſily be demonſtrated to be a Miſtake. Likewiſe, if their Demonſtrations be juſt, it will follow, that the firſt Drops of Water, which iſſue out from the Hole, muſt run with the ſame Velocity, as after the Water has been running ſome time; the Contrary of which appears to be true in Fact by the Experiments of the famous Mr. *Mariotte*.

The Author might have found a juſter Account of this matter in the Writings of a Great Man, whom he cites on another Occaſion; the ſecond Edition of whoſe Book was come out ſome time before *Herman* publiſh'd either of thoſe Demonſtrations, and had been ſeen by him, as appears by his quoting it frequently, and mentioning the Difference in this very Particular between the firſt and ſecond Edition.

Our Author goes on to conſider the ſimple Motion of Water running out by a Section perpendicular to the Horizon, in the ſide of a Receptacle, which is always entertain'd at the ſame Height. He ſhews, that the Velocities, with which the Water iſſues out at different Depths,

Depths, being as the Roots of thoſe reſpective Depths, may be repreſented by the Ordinates of a *Parabola*, whoſe Axis repreſents the entire Depth of the Water. Conſequently, ſince the Quantities of Water, running out at different Depths, are as thoſe Velocities, they likewiſe may be repreſented by the ſame Ordinates, and the Quantity of Water diſcharg'd from the whole Section, will be repreſented by the Parabolick Space; and the mean Velocity by that ſame Space divided by the Abſciſſe.

The Times, being as the Quantities of Water diſcharged, may be repreſented in the ſame manner as thoſe Quantities.

Hence he derives his general Theorem, That the Quantities of Water diſcharged, are in a *ratio* compounded of the ſeſquiplicate *ratio* of the Depths of the Water, the *ratio* of the Breadths of the Section, and of that of the times of the Efflux.

The Author proceeds now to the mixt Motion of Water; in order to diſcover the Nature of which he has made ſome curious Experiments, after the following manner:

A large cylindrical Veſſel, with a perpendicular Section through the ſide of it, was placed upright in a dead Water; ſo that the bottom of the Veſſel was a conſiderable Depth below the Surface of the Water; and the Veſſel was kept immovable in this ſituation.

Above this was fixt another Veſſel, full of Water, whoſe Bottom was pierced with 16 Holes, exactly round, and of the ſame Bore, and ſo order'd, as to be open'd, or ſtopt at pleaſure. The Water in this Veſſel was always kept at the ſame Height, by means of a third Veſſel, which ſupply'd the Water, as faſt as it ran out at the round Holes in the Bottom; and a large Aperture, in the ſide of the ſecond Veſſel near the Top, prevented the Water in it from exceeding the due Height. To break the Force of the Water running into the two lowermoſt Veſſels, they were each of them divided by a Board, placed perpendicular, but not reaching the Bottom, which ſeparated the Part where the Water came in, from that where it went out.

The *Apparatus* being thus fixt, three of the round Holes in the Bottom of the ſecond Veſſel were unſtopt, to let the Water run into the lower Veſſel. Where not running out at the Section in the ſide, ſo faſt as it came in from above, it roſe to a conſiderable Height above the Surface of the dead Water; after which, the Efflux of the Water becoming equal to the Influx, it roſe no higher.

In other Tryals the Water being ſuffer'd to run from 6, from 9, 12, and 15 of the round Holes, the Water roſe ſucceſſively to greater Heights, before the Section diſcharged it as faſt, as it came in.

The Experiment being repeated with opening other Numbers of the round Holes, with Sections of different Breadths, and at different Depths of the dead Water, the ſeveral Heights, to which the Water roſe in the Veſſel, were carefully obſerv'd and ſet down.

Other Experiments were made by placing the lower Veſſel on dry Ground, and the ſeveral Heights to which the Water roſe in the Veſſel, according as different Quantities were ſuffer'd to run in, were likewiſe obſerv'd, and found agreeable to the Heights deduced by Calculation from the general Theorem above-mention'd, concerning the ſimple Motion of Water.

The Learned Author comes now to apply theſe Experiments, in order to diſcover the Theory of mixt motion, to which end he lays down theſe two Hypotheſes.

Firſt, he ſuppoſes, that the Velocity of the running Water is every where in a ſubduplicate *ratio* of the Depth, and conſequently the Quantities diſcharged may be repreſented by the Parabolick Spaces, juſt as in the caſe of the ſimple Motion of Water.

Secondly, that the Velocity of the dead Water, is the ſame at all Depths, and equal to the greateſt Velocity of the running Water. Wherefore the Quantity of dead Water diſcharged may be repreſented by a Rectangle, whoſe Height repreſents the Depth of the ſtagnant Water, and whoſe Baſe is the greateſt Ordinate of the Parabolick Space abovementioned.

Having thus contrived a way of repreſenting the Quantities of Water diſcharged by the mixt Motion, as had been done before for the ſimple Motion of Water, our Author obſerves that the Velocities of the Water iſſuing out at different Depths, and conſequently the Parabolick Spaces repreſenting the Quantities of Water expended, muſt be leſs in the mixt, than in the ſimple Motion.

In order therefore to find a general Rule for determining the Proportion between the Parabolick Spaces, which repreſent the Quantities diſcharged by the mixt and ſimple Motion, or between the Parameters of thoſe *Parabolas*, he draws ſome Obſervations from the foregoing Experiments, by the help of which he hopes ſuch a Rule may be found out.

Firſt, he obſerves, that, if the Depth of the running Water continue unchanged, a greater Depth of dead Water requires a leſs Parameter.

Secondly, That this Parameter does not decreaſe in ſo great a Proportion, as the Depth of the Water increaſes

Thirdly, That, if the Depth of the dead Water decreaſe, or the Depth of the running Water increaſe in ſuch

ſuch manner, that the latter becomes infinitely great in proportion to the former, then the Parameter of the mixt Motion muſt become equal to that of the ſimple Motion.

Fourthly, That, if the Depth of the dead Water become infinitely great in compariſon of the Depth of the running Water, the Parameter of the mixt Motion vaniſhes, or becomes equal to nothing.

The Rule, therefore, which is to be found, ought to agree with all theſe Obſervations, and beſides muſt produce the ſame Quantities of Water by Calculation, as were found by Experiment to anſwer to the ſeveral Depths of running and dead Water, in the above mention'd Tryals.

Upon this Foundation the Learned Author proceeds, in a tentative Method, to find his Rule, and having diſcover'd it, he ſhews by Calculation, that it anſwers all the Conditions before requir'd.

This Rule is expreſt in a pretty high Equation, which, beſides other Operations, requires the extracting the Root of the ſixth Power.

From this Equation is derived another, ſerving to find either the Quantity of Water diſcharg'd, the Depth of the running, or that of the dead Water, the other two of them being given; as likewiſe a third Equation, to find the mean Velocity.

Our Author goes on to ſhew the Uſefulneſs and Neceſſity of conſidering the Doctrine of mixt Motion, in all Queſtions relating to the Courſe of Rivers, the Quantities of Water which they diſcharge, the enlarging or narrowing their Outlets, the ſcouring and deepening their Channels, and the Motion of the Tides in Harbours. Theſe he illuſtrates by ſeveral Deductions from the Equations above mention'd; to render which of greater Evidence, it were to be wiſht, that thoſe Equations were built upon a more ſolid Foundation than a tentative *Calculus*; and that Allowance had been made for the Velocity impreſt upon the preceding Water in Rivers, by the *impetus* of that which follows, which is omitted by the Author in his Theory, both of mixt and ſimple Motion.

In the Second Book, this Learned Writer propoſes the State of the *Laguna* of *Venice*, as a proper Example, to demonſtrate the Uſefulneſs of his new Theory. He conſiders very minutely the ſeveral Cauſes of choaking up the *Laguna*, examins the Methods propoſed by various Authors for ſcouring and keeping it clear, ſome of which he rejects as impracticable on account of the Expence, others as uſeleſs, or prejudicial; and laſtly delivers his own Opinion.

The principal Cauſes, which he aſſigns, of filling up the *Laguna*, are the Rivers running into it, and the Sea.

The Rivers, which enter it, ariſing out of the *Alps*, and running down with great Rapidity, carry with them, eſpecially after Rains, great Quantities of Soil, which is eaſily ſuſpended in the Water, ſo long as that Swiftneſs of Motion continues. But when they come into the *Laguna*, the Water, upon extending it ſelf over that vaſt Surface, looſes almoſt all its Velocity, and conſequently the Soil and Filth, which before it carry'd with it, ſubſides in great Quantities to the Bottom.

The Remedy our Author propoſes for this Inconvenience, is either wholly to divert the Courſe of the Rivers and carry them, by another Way, directly into the Sea; or at leaſt, to ſecure their Outlets with Sluices, ſo as to ſuffer them to paſs into the *Laguna*, when their Waters are clear; but after great Rains, when they run foul and turbid, to ſtop their Paſſage that way, and let them out by the other Channel into the Sea.

The ſecond principal Cauſe of choaking up the *Laguna*, is the Sea. Concerning which our Author obſerves, that the Tide of Flood ſets into the *Laguna* from along the Coaſt of *Iſtria* and *Friuli*, where it is perpetually waſhing away the Land in great Quantities, with which, and the Sand which it raiſes upon high Winds in the Shallows near the Shore, it enters the *Laguna* exceedingly turbid and foul; eſpecially, when the Wind blows hard at South-Eaſt, at which times the Tide of Flood is ſeveral Hours longer than the Ebb. This occaſions very high Tides in the *Laguna*, and a great part of the Water which enters by the Flood, not being carry'd out by the ſubſequent Ebb, has the more time to diſcharge its Soil and Sand in the *Laguna*.

This is an Enemy very hard to deal with, however our Author propoſes ſome Works of ſtrong Piles, and large Stones thrown in between them, to be carried directly forward into the Sea, in order to break the Violence of the Waves, and prevent their waſhing and carrying away the Land.

He ſeems likewiſe to favour a Propoſal made by the late famous *Guglielmini*, and ſome others, to let the Tide enter the *Laguna* by more Paſſages than it is to go out at, in order to make it run out with a greater Velocity, and thereby ſcour and deepen the Channels. But he thinks this Contrivance will ſcarcely perform all that is expected from it; beſides that, it will be attended with great Difficulties in making Works, and Flood-gates of a ſufficient Strength, to reſiſt the Violence of the Waters.

He occaſionally combats the Opinion of *Guglielmini*, and moſt other Mathematicians who have thought upon the Subject, that in order to give a greater Velocity to the Water of a River, thereby to ſcour and cleanſe the Channel, it is proper to make the Outlet narrower.

narrower. This our Author maintains to be oftner falſe, than true, and endeavours to ſhew from his Theorem above-mention'd, that making the Outlet narrower, will frequently cauſe the *mean Velocity* of the Waters to become leſs than it was before. But whether a Propoſition of ſuch Conſequence, and ſeemingly ſo well ſupported by Reaſon and Experience, ought to be condemn'd upon the Authority of a Theorem founded only upon a tentative Calculation, muſt be left to the Judgment of the Learned.

II. Apollonii Pergæi *Conicorum Libri Octo*, & Sereni Antiſſenſis *de Sectione Cylindri & Coni Libri duo. Fol. Reg. E Theatro* Oxon. 1710.

THE worthy Curators of the *Oxford* Preſs having obliged the Publick with a very elegant Edition of the Works of *Euclid*, *Græco-Latinè*, were pleas'd further to proceed in the laudable Intention of giving the reſt of the ancient *Greek Mathematicians* in the ſame beautiful Form: In this Deſign they were chiefly animated by the late learned and beneficent *Dean* of *Chriſt Church*, Dr. *Henry Aldridge*, who pitching upon *Apollonius*, as moſt proper to ſucceed *Euclid*, engaged the two *Savilian* Profeſſors to take upon them the Care and Pains of the Edition: Dr. *David Gregory* promiſing his Aſſiſtance as to the firſt Four Books, which are ſtill extant in *Greek*; and Dr. *Edm. Halley* undertaking to tranſlate the Fifth, Sixth, and Seventh Books out of *Arabick* (in which Language they were only to be found) and to endeavour to reſtore the Eighth, long ſince wholly loſt. But Dr. *Gregory* ſoon after dying, the Care of the Whole devolved on Dr. *Halley*, who hath ſpared no Pains to render the Work complete.

He in his Preface tells us what Helps he had to perfect the Text, That he had the uſe of two *Greek MSS.* of the firſt Four Books, one of which was Sir *Henry Savil's*, and is in the *Savilian Study* at *Oxford*, the other is now in the Royal

Royal Society's *Muſeum*, having been lately preſented them by that skilful Mathematician Mr. *William Jones*, F. R. S. That he had only one Manuſcript of *Eutocius's* Commentary, out of the *Bodley* Library; and two *Greek* Copies, from the *Savilian Study*, of *Pappus's* Collections, out of whoſe 7th Book he took the *Lemmata*, which ſerve as a Comment on the more difficult Places of his Author; and that he was forced to reviſe and correct the Miſtakes and Improprieties of the Latin Tranſlation of *Commandine*.

As to the latter Books, which were only in *Arabick*, he informs us, that he made uſe of the *Bodley* Tranſcript of a *Manuſcript* that is at *Leyden*, which it ſelf is a late Copy of that ancient *Arabick* Book of the *Conicks*, heretofore *Golius's*, but ſince purchaſed by that great Patron of Univerſal Learning, *Narciſſus* late Primate of *Ireland*, who was pleaſed to favour him ſo far as to ſend over into *England* this Original Book whereby he not only amended ſeveral Faults committed by the Copyiſts in a double Tranſcription, but was alſo aſſured that this *Arabick* Book was a verbal Tranſlation from the Greek; the ſame Schemes markt with the ſame Letters, and the whole Context being the ſame in the firſt four Books of it, as in the Greek *Apollonius* This valuable Manuſcript, with about 800 others, *Oriental* and *Greek*, has ſince, by the Donation of that moſt venerable Prelate, made a noble Acceſſion to the *Bodley* Library, wherein it is now depoſited. It appears by an *Epigraphe* at the end, to have been written in the Year of Chriſt 1303. and to have been a Copy of a Tranſlation of the Conicks, made ſome Ages before by *Thebit Ben Corah*, but then newly reviſed by that famous *Perſian* Mathematician *Naſir-eddin*, who flouriſh'd about the middle of our thirteenth Century.

Beſides this, the Editor tells us, that on occaſion he conſulted another *Arabick* Manuſcript (heretofore *Ravius's*) of great Antiquity, being an *Epitome* of the ſame Books by *Abdolmelec* of *Schiraz*, every where agreeing in the Order and Argument with the former, but abridg'd. So that having had theſe Helps, he is in hopes that he has ſo far retrieved thoſe Three Books of *Apollonius*, that the Loſs of the *Greek* Text may henceforth be leſs lamented.

The Eighth Book of theſe Conicks, was wanting in the *Greek* Copies even before the Traduction of them into *Arabick* by *Thebit*: But it having been obſerv'd that there was a very near relation between the Arguments of the VIIth and VIIIth Books, for that the ſame *Lemmata* of *Pappus* were common to them both, which are different to all the reſt, it ſeemed that the *Theoremata Dioriſtica* of the VIIth Book were deſigned to determine the Limits of the *Problemata Dioriſména* of the VIIIth; and therefore ſuppoſing what thoſe Problems might have been, and their Order from that of the ſaid Theorems, Dr. *Halley* has in XXXIII Propoſitions given the *Analyſes* and *Syntheſes* of them, after the Method of the Ancients, every where following the Steps of *Apollonius* to be found in his VIIth Book. This he calls *Conicorum Liber Octavus reſtitutus*, and may ſerve the turn, till ſuch time as the Original Eighth Book come to light; if that be not now to be deſpair'd of.

Becauſe of the Affinity of the Subject, he hath ſubjoin'd the two Books of *Serenus Antiſſenſis*, the Greek Text of which was never before in print. This was procured by the abovefaid Reverend *Dean* of *Chriſtchurch*, Dr. *Aldrich*, in a collated Copy of three Manuſcripts extant in the King's Library at *Paris*, and by him, according to his wonted Goodneſs and Generoſity, freely communicated for the uſe of the Publick. To this alſo is added the Latin Tranſlation of *Commandine*, which in many Caſes needed Caſtigation.

As to the Authors themſelves little needs be ſaid, they having ſtood the Teſt of ſo many Ages, and been highly valued by the Learned in all Times, eſpecially the Conicks, juſtly eſteemed a Maſterpiece in the Geometry of the Ancients: So that it may ſeem ſtrange, that a Book ſo excelling in its kind ſhould not till now have been printed in its native *Greek*, a Tongue ſo peculiarly adapted to Mathematical Purpoſes. But this preſent Edition may make ample Amends, the Paper and the Elegance and Correctneſs of the Print being remarkable. The Book is now to be had of Mr. *Chriſtopher Bateman* in *Pater-noſter Row*, *London*.

Printed for *W.* and *J. Innys*, at the *Prince*'s *Arms*
in St. *Paul*'s Church-yard. 1718.